

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)	
)	
Facilitating Opportunities for Flexible,)	ET Docket No. 03-108
Efficient, and Reliable Spectrum Use)	
Employing Cognitive Radio Technologies)	
)	
Authorization and Use of Software Defined)	ET Docket No. 00-47
Radios)	(Terminated)
)	
To the Commission:		

Via the ECFS

COMMENTS OF IEEE-USA

IEEE-USA respectfully submits its comments in the above-captioned Proceeding (“the NPRM”).

These comments were developed by the IEEE-USA Committee on Communications and Information Policy and represent the considered judgment of a group of IEEE-USA members with expertise in the subject field.¹

IEEE-USA is an organizational unit of The Institute of Electrical and Electronics Engineers, Inc., created in 1973 to advance the public good, while promoting the careers and public-policy interests of the more than 235,000 electrical, electronics, computer and software engineers who are U.S. members of the IEEE, and as such is an interested party in the instant Proceeding.

The IEEE is the world’s largest technical professional society. For more information, go to <http://www.ieeeusa.org>.

¹ In fact, most of the material presented herein is derived from an IEEE-USA Position Statement “*Improving Spectrum Usage Through Cognitive Radio Technology*” that was approved by the IEEE-USA Board of Directors on November 13, 2003.

INTRODUCTION

1. IEEE-USA strongly encourages the Commission to continue the innovative thinking evidenced by its initiative in the instant NPRM. Action by the Commission to encourage and facilitate the development and implementation of Cognitive Radio (CR) technology shows great promise, as the technology is proven and fielded, to result in significantly more efficient use of otherwise unused, or under-used, portions of the finite radio spectrum resource.

SPECIFIC RECOMMENDATIONS

2. Given the increasing demand for radio spectrum - a finite resource - and the potential for CR technology to facilitate sharing of otherwise unused or under-used spectrum (temporally and geographically), IEEE-USA strongly recommends that the FCC, with the cooperation of other government agencies and private sector entities:

- Determine, through industry/government sharing studies, in which bands CRs can be used with confidence, and validate the results of those sharing studies through initial field trials.
- Confirm the technical reliability and practicality of CR, by resolving technical issues including:
 - What suitable "behaviors" and minimal technical restrictions are necessary to ensure CRs will operate without causing harmful interference to licensed users?
 - How can a licensed frequency user determine that any interference received is actually the result of cognitive radio operation, rather than from some other source?
 - What is the cumulative effect of very large numbers of CR users?
- Create a regulatory environment that permits CR technology implementation, while providing a method of redress and resolution for instances where interference might occur.
- Consider, in its formulation of rules for CRs, the efforts of industry standards bodies to develop standards for CR implementation, in order to foster a healthy market for compatible, interoperable CR implementations in the interest of promoting coexistence and allowing users to benefit from the economies of scale that derive from the existence of such standards.

HOW AND WHERE TO IMPLEMENT CR AND PROVE ITS BENEFITS

3. IEEE-USA suggests that CRs first be proven effective in spectrum that could be considered "low hanging fruit" (i.e. spectrum that has a relatively low percentage of actual usage by the authorized users, and for which the actual occurrence of limited amounts of interference would not be catastrophic).
4. For example, some bands may not be currently in use. Or, some bands have low average usage. And, some TV broadcast channels are not used at all in geographic areas where CR could be tried.
5. Clearly, initial trials should not be implemented in particularly "sensitive" spectrum such as that used by the Department of Defense, law enforcement agencies, fire departments, and other critical uses. In such cases, the spectrum is often used only a small amount of time on average, but when it is needed, it is vitally important that it be available, without interference. After significant trials and experience, perhaps CRs could even be used in those spectrum ranges; but surely caution must be exercised in initial technology trials.
6. Even in the end, CR may not be suitable for use in some spectrum bands, such as spectrum used for the global positioning satellite (GPS), or spectrum used by satellites for observing weather patterns. In such cases, the CR may be unable to reliably detect any competing use of the spectrum, which could result in interference with its authorized use.

COGNITIVE RADIO AND SOFTWARE DEFINED RADIO ARE NOT NECESSARILY SYNONOMOUS

7. While it is certainly possible to implement CR as a software defined radio, it is not implicit that a CR must be software defined radio. It is entirely possible to implement CR features – the ability to detect and avoid (protect) incumbent users – while using relatively conventional radio transmitter/receiver architectures and techniques.

REAL WORLD TRIALS OF CR MUST TAKE PLACE IN REALISTIC CONDITIONS

8. While at first glance unlicensed spectrum may appear to be a good candidate for initial CR testing, it is necessary to consider the number of consumer and industrial devices that may or do use that spectrum. In fact, some of the unlicensed bands (e.g., 2.4 GHz) are already extremely crowded with devices sharing the band. Thus, experiments with CR in the unlicensed spectrum bands would not fully answer the issues of how CR could be used in licensed spectrum bands, where spectrum occupancy and the characteristics of incumbents could be quite different (and will vary from subject band to subject band, according to existing uses). Such issues must be addressed to take full advantage of CR potential to allow increased sharing of otherwise unused licensed spectrum.
9. Clearly, there are both technical and regulatory issues that must be answered before any large-scale CR implementation can proceed, even after limited trials have demonstrated CR technology's effectiveness. The creation of a regulatory environment that permits and facilitates CR technology implementation, while providing a method of redress for instances where harmful interference to licensed users might occur, and providing for its resolution, is clearly very important.
10. IEEE-USA strongly encourages the FCC and other government agencies, as well as the private sector, to pursue CR technology development and application as vigorously as possible. The goal is to relieve radio spectrum overcrowding, which actually translates to a lack of access to full radio spectrum utilization.

SUMMARY AND CONCLUSION

11. As stated above, IEEE-USA believes that CR technology holds great promise, and we applaud the Commission for its proactive approach to exploring how CR technology may be deployed to increase the efficiency of spectrum utilization through greater access to spectrum, while assuring that the rights and interests of incumbent licensees are adequately protected.

12. We also have had an opportunity to review, and find ourselves to be supportive of the separately filed comments of IEEE 802, the Local and Metropolitan Area Network Standards Committee, in this Proceeding.

13. We encourage the Commission to move forward rapidly in creating the necessary regulatory environment to foster the development, validation, and deployment of CR technologies, taking into account our recommendations and comments above, as well as the those contained in the separately-filed Comments of IEEE 802.

Respectfully submitted,

/s/

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